

REMARKS

Claims 1-11 are pending in the application. Claims 1-3, 9 and 11 are rejected. Claims 6 and 10 are allowed. Claims 4, 5, 7 and 8 are withdrawn from consideration.

Applicants thank the Examiner for courtesies extended during the Interview of November 9, 2006.

Claim Rejections - 35 U.S.C. § 103

Claims 1, 2, 3, 9 and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Peterson, Jr. (6,769,625) in view of Ono (JP 59-128968) and Willke et al (5,862,991). This rejection is traversed for at least the following reasons.

Claimed Combination Not Taught

Applicants submit that the present invention combines several features, including (A) the valve shape, having (1) a generally spherical form with (2) flat sides and (3) a flat bottom, and (4) a size of an inlet that is larger than the flat bottom and permits the flat bottom face to enter and be positioned within the inlet and (B) a nozzle plate with a plurality of inlet holes.

Applicants assert that this combination of features gives important advantages not found in the prior art, as detailed in the specification. Applicants submit that the Examiner has identified bits and pieces of the invention in three different prior art references, but each of these fail to teach or suggest any basis for their combination. No single reference teaches any more than three of the above features. Moreover, as subsequently discussed, there are features of the three references that make them incompatible and preclude any teaching or suggestion for their combination.

The Examiner has acknowledged that Peterson fails to teach a valve body with flat sides, a flat bottom and a portion of the sphere that enters the inlet. Moreover, Peterson fails to

disclose an inlet, as claimed, altogether. Ono fails to teach flat sides and a nozzle plate with inlet holes. At best, Ono shows a flat bottom portion of a spherical valve body entering an inlet, but in the absence of a nozzle plate at the end of nozzle 19, or any of the other relevant structure of the claimed valve seat member, this does not offer the advantages of fluid flow provided by the present invention. Finally, Willke et al fails to teach a flat bottom or the desirability of a flat bottom entering an inlet. It is noted that Willke et al also fails to disclose an inlet according to the claimed invention.

Only the teachings of Applicants' invention would lead one skilled in the art to combine the diverse teachings of the three references. Peterson has no need for flat sides or a flat bottom, as would be clear from a review of Figs. 2A and 2B of the patent. Moreover, there is no reason to have the bottom of the valve body enter into an inlet, as Peterson does not disclose an inlet in the first place. Ono would have no need for flat sides and has no disclosed reason for having a nozzle plate. Clearly, Ono does not recognize the advantage of having a nozzle plate with inlet ports and relies upon a direct injection of fuel via nozzle 19. Willke, while teaching a nozzle plate with plural ports, does not recognize the need for a valve body with a flat bottom nor the advantage of even having the bottom of the sphere enter into an inlet.

As previously noted, Peterson teaches that the fuel passages are shaped as a cone having a diameter that gradually and continuously increases away from the outlet of the injection port, as illustrated in Figs. 2A and 2B. However, the interface between the ball 126a and the seat surface in Pederson is primarily at the perimeter of the opening of the fuel passage and makes a line contact, as taught at col. 4, lines 56-65. Similarly, the interface between the ball and the seat

surface in Ono is primarily at the perimeter of the opening and makes a line contact. As Applicants previously asserted, a greater surface area is in contact with the present invention, thereby providing greater sealing capacity, as illustrated in Fig. 2. This offers a significant distinction in performance.

In addition, with respect to the structure of the valve seat member, it is noted that the claimed invention includes: (1) a valve seat face, (2) an inlet, (3) an injection port, and (4) a fuel passage defined by the area connecting the injection port of the valve seat member to the nozzle holes.

None of the cited references teaches or suggests this structure. As noted above, Peterson merely discloses three aspects of the valve seat member structure: a valve seat face, injection port and fuel passage. There is no inlet port disposed between the valve seat face and injection port. Ono, on the other hand, discloses a totally different structure, and while there is a port in which the flat face of the ball body is disposed, there is no correlation between this port area and its relationship between the valve seat face and injection port of Peterson. In fact, it appears to merely correlate to the valve seat face. In other words, Ono fails to provide any motivation for adding an additional inlet structure to Peterson. Finally, Willke also fails to teach such an inlet, since this reference merely discloses a valve seat face, injection port and fuel passage.

Given the teachings of the prior art references, one of ordinary skill in the art would not have been motivated to modify Peterson to add an inlet.

Incompatibility of the References

As to the incompatibility of Peterson, Ono and Willke, it is noted that Peterson uses a guide member 127 which has fuel holes 127a, 127b therein and through which the ball 126a appears to pass, while neither Ono nor Willke has such guide member.

In the Ono reference, fuel enters the top cover (29) and passes through an interval envelop (8), a central passage (30) within plunger (6), and enters the valve chamber ('fuel chamber) (18) via a cutout (31) of a tip of plunger (6). In the state of Figs. 1 and 2 of the Ono patent, the solenoid coil (3) is not biased, a spring force of spring (9) contacts under pressure with the seat surface (21) so that the valve is closed and the fuel injection is stopped. If solenoid coil (3) is biased, the plunger (6) is moved in the rightward direction so that a ball surface (17) of the stopper is brought in contact with truncated cone surface (15) and is stopped. At the same time of the rightward movement of the plunger (6), the ball (7) is separated from seat surface (21) and fuel of a predetermined quantity is injected from the nozzle (19) via the gap provided therebetween. Then, the solenoid is de-energized, the ball (7) is contacted with the seat surface (21), and the fuel injection is stopped. The above-operation is repeated so that the predetermined quantity of fuel is injected.

It is emphasized that the structure in the Ono reference is completely different from Peterson. It is a single nozzle structure with the tapered surface adjacent to the nozzle, but fails to teach or suggest any relationship between a valve seat surface, inlet and injection port, wherein the injector port is downstream of the valve seat face via the inlet. There is no showing for how an inlet could be integrated into the Peterson reference so that it would be disposed between the valve seat face and the injection port.

In addition, Ono discloses a guide pipe (5) in Fig. 2, but the guide pipe in Ono does not function in the same manner as the guide member 127 in Peterson or the cylinder 15 in structure 16 of Willke. These are wholly different arrangements leading to different physical and operational considerations that would preclude one skilled in the art from considering a combination of features from these references. Indeed, if any combination were considered, overcoming the incompatible features of the three references would necessitate invention and would not be obvious.

Still further, it is noted that it is advantageous with respect to fuel flow to have the flat bottom of the valve member enter the inlet at one end and to have a nozzle plate with multiple holes at the other end of the nozzle passage. As mentioned in the specification, increased flue flow speed and acceleration in atomization of the fuel is achieved with the present invention. This feature of the present invention is completely lost with the combination of cited references.

In sum, Applicants respectfully submit that claims 1 and 9 are clearly patentable and that all other claims, including the withdrawn claims, would be allowable due to their dependence on claim 1.

Allowable Subject Matter

Applicants note with appreciation that claims 6 and 10 are allowed.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Appln. No. 10/797,103

Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: November 13, 2006

Attorney Docket No.: Q79127



PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q79127

Takahiro SAITO, et al.

Appln. No.: 10/797,103

Group Art Unit: 3752

Confirmation No.: 4570

Examiner: Steven GAINERY

Filed: March 11, 2004

For: FUEL INJECTION VALVE

STATEMENT OF SUBSTANCE OF INTERVIEW

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Please review and enter the following remarks summarizing the interview conducted on November 9, 2006 between Examiner Steven Gainey and Ellen R. Smith:

REMARKS

An Examiner's Interview Summary Record (PTO-413) has not yet been received by Applicant's representatives.

During the interview, the following was discussed:

1. Brief description of exhibits or demonstration: None
2. Identification of claims discussed: Claim 1
3. Identification of art discussed: Peterson, Ono and Willke
4. Identification of principal proposed amendments: None
5. Brief Identification of principal arguments: The combination of cited references fail to arrive at the claimed invention, especially with respect to formation of an inlet port. Also, one

STATEMENT OF SUBSTANCE OF INTERVIEW
U.S. Appln. No. 10/797,103

of ordinary skill in the art would not have known to modify Peterson in the manner stated in the Office Action merely based on the cited references as there is no motivation provided therein.

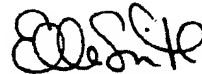
6. Indication of other pertinent matters discussed: None

7. Results of Interview: None reached.

It is respectfully submitted that the instant STATEMENT OF SUBSTANCE OF INTERVIEW complies with the requirements of 37 C.F.R. §§1.2 and 1.133 and MPEP §713.04.

It is believed that no petition or fee is required. However, if the USPTO deems otherwise, Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,



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